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Nanocomposites Blends Consisting of Nanoclay Filled Polypropylene and Carbon Nanotube Filled Polycarbonate

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Blends were prepared from a conductive polycarbonate composite containing multiwalled carbon nanotubes (PC-MWNT) and nanoclay (montmorillonite) filled polypropylene (PP-MMT). The PC composite, containing 2 wt% MWNT, was prepared by diluting a PC masterbatch by melt extrusion. The PP nanoclay composite with 3 wt% MMT was prepared by melt compounding. The blends were prepared by melt mixing over the whole composition range.

This blend system is immiscible and shows particle-matrix morphologies at low concentrations of both phases. Between 50 and 80 wt% of the filled PC phase a co-continuous composition range was observed as verified by selective extraction of PC and morphological investigations. Moreover, melt rheology was found to be a suitable tool to detect the co-continuous composition range in these blends which exhibit double percolation. The effects of percolation structure of MWNT and exfoliation of MMT were observed in increasing the dynamic mechanical moduli and viscosity of the PC and PP nanocomposites as compared to the respective base polymer components. The co-continuous structure formation in the blends is clearly reflected in dynamic mechanical moduli and viscosity of the blends which are improved above the values of the parent components. This was observed within a composition range from 50 up to 80 wt% of filled PC. DSC investigations did not show significant effects in the melting behaviour of the PP in the blends. However, the nanofiller acts as nucleation agent as revealed from the crystallization runs. Significantly increased conductivity values, i.e., in the range of 10^{-7} S/cm could be obtained in the composition range in which the filled PC forms a continuous phase, i.e. starting at 50 wt% (absolute MWNT content about 0.7 vol%) of the filled PC phase.